

II. SPECIAL CONDITIONS

H-3.8 VERTICAL SPEED CONTROL DEVICES

1. GENERAL

1.1. Description

This standard identifies minimum requirements that shall be met for all Vertical Speed Control Devices in the design and construction of elements for Arlington County Horizontal Design Standards. The development of this standard is to provide greater guidance in the design and construction of vertical speed control devices while meeting the County's guiding principles for increasing pedestrian safety and accessibility, decreasing county infrastructure costs and balancing the use of the Right-of-Way between all modes of transportation.

1.2. Related Arlington County Standards

- A. Arlington County Construction Standards and Specifications
- B. Arlington County Neighborhood Traffic Calming Manual
- C. Arlington County Horizontal Standards H-3.1 Driveway Entrances
- D. Arlington County Horizontal Standards H-3.2 Curb Ramps
- E. Arlington County Horizontal Standards H-3.3 Curb Extensions
- F. Arlington County Horizontal Standards H-3.7 Crosswalks

1.3. Applicable Standards and Specifications

- A. Manual of Uniform Traffic Control Devices (MUTCD)
- B. Code of Virginia
- C. Americans with Disabilities Act - Accessibility Guidelines for Building and Facilities (ADAAG)
- D. American with Disabilities Accessibility Guidelines for Public Rights-of-Way (PROWAG)

1.4. Quality Assurance

- A. [Reserved]

1.5. Submittals

- A. Vertical speed control devices used in traffic calming shall be placed consistent with the Neighborhood Traffic Calming (NTC) manual. All other uses shall be approved by the DES Transportation Engineering and Operations (TE&O) Bureau Chief.

2. DESIGN CONSIDERATIONS

2.1 Definition

Vertical Speed Control is a raised device used to reduce vehicle speed on streets. These devices can be in the following forms:

2.1.1. Speed Tables

Speed tables are generally placed mid-block in a series of several devices on neighborhood minor streets. Speed tables shall not be used on primary emergency response route.

2.2.2. Speed Cushions

Speed cushions are generally placed mid-block in a series of several devices on neighborhood minor streets designated as a primary emergency response route.

2.2.3. Raised Crosswalk

Raised crosswalks are generally placed on neighborhood minor streets or segregated right turn lanes. They are generally placed at intersection or mid-block locations. Raised crosswalks shall not be used on primary emergency response route.

2.2.4. Raised Intersections

Raised intersections are generally placed at the intersections of two neighborhood minor streets. Marked crosswalks shall be included within the limits of the raised intersection. Raised intersections shall not be used on primary emergency response route.

2.2. Purpose

1. The primary purpose of a vertical speed control device is to reduce vehicle speed on streets.

3. DESIGN

3.1. Dimensions

3.1.1. Speed Table

a. A speed table is a short, raised street section that extends across the roadway. Speed tables are gradual changes in the roadway surface 22 feet long and 3.5 inches high and placed a minimum of 100' from an intersection. Speed tables are most effective if used in a series; spaced 300 to 500 feet apart. Speed tables shall be installed with the appropriate signage. Speed tables may be used as traffic calming devices consistent with the NTC manual or as designated by the TE&O Bureau Chief.

3.1.2. Speed Cushions

a. A speed cushion is a short, raised street section that extends across the roadway. They are 22 feet long and 3.5 inches high and placed a minimum of 100' from an intersection. There are three sections to the speed cushion, which allows emergency vehicles to drive through the center section without affecting response

time or jolting patients in an ambulance. Speed cushions are most effective if used in a series; spaced 300 to 500 feet apart. A marked centerline shall be installed along with speed cushions as well as the appropriate signage. Speed cushions may be used as traffic calming devices consistent with the NTC manual or as designated by the TE&O

Bureau Chief.

3.1.3. Raised Crosswalks

Raised crosswalks are marked crosswalks (refer to Arlington County Horizontal Standards H-3.7 Crosswalks) placed on a modified speed table. Raised crosswalks identify the preferred path for pedestrians and bicyclist to cross the roadway where there may be potential conflict. Raised crosswalks may be placed at intersections or mid-block locations and may be used as traffic calming devices consistent with the NTC manual or as designated by the TE&O Bureau Chief.

a. Mid-Block

i. Typically 6" in height with a 32' length measured along the street center line. Refer to detail VSC-3.0.

ii. The marked crosswalk shall comply with the Arlington County Horizontal Standards H-3.7 Crosswalks standard. The full width of the crosswalk shall be included within the flat portion of the speed table.

iii. Design shall ensure that positive drainage be provided across the crosswalk and at all adjacent curbs.

iv. It is preferred that a catch basin be located directly upstream of the raised crosswalk.

v. Alternate drainage may be provided by the designer if catch basins can't be located directly upstream of the raised crosswalk in the form of a diversion channel supporting ADA compliant heel proof grates. refer to VSC-3.0

vi. When the designer is faced with conflicts involving; emergency response routes, significant bus routes, utilities, driveways or drainage, the height of the crosswalk may be modified.

vii. Modified raised mid-block crosswalks

1) Typically, 3.5" in height with a 22' length measured along the street center line. Refer to detail VSC-4.0.

2) The marked crosswalk shall comply with the Arlington County Horizontal Standards H-3.7 Crosswalks standard. The full width of

the crosswalk shall be included within the flat portion of the speed table.

3) ADA compliant ramps shall be provided

4) It is preferred that a catch basin be located directly upstream of the modified raised crosswalk.

5) A diversion channel supporting ADA compliant heel proof grates may be needed when curb extensions are used with the modified raised crosswalk.

b. Intersection

i. Typically 3.5" in height with a 22' length measured along the street center line. Refer to detail VSC-5.0.

ii. The marked crosswalk shall comply with the Arlington County Horizontal Standards H-3.7 Crosswalks standard. The full width of the crosswalk shall be included within the flat portion of the speed table.

iii. ADA compliant ramps shall be provided

iv. Design shall ensure that positive drainage be provided across the crosswalk and at all adjacent curbs.

v. Catch basins shall be located directly upstream of the raised crosswalk. A diversion channel shall not be used as a means of addressing drainage issues.

vi. Where placement of a crosswalk in combination with road geometry permits, a 6" high modified crosswalk may be used.

vii. Modified raised crosswalks at intersections

1) Typically, 6" in height with a 32' length measured along the street center line. Refer to detail VSC-6.0.

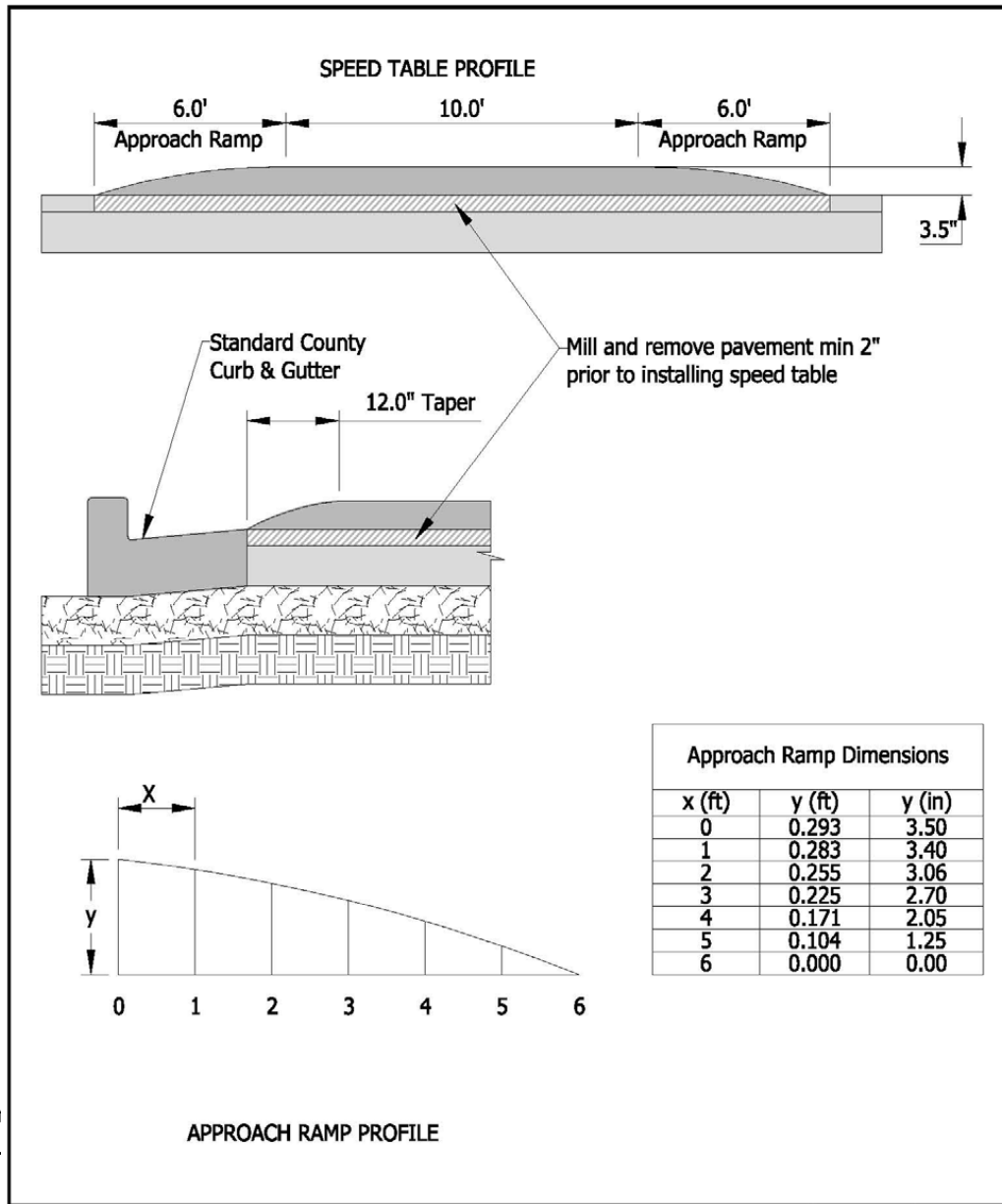
2) When the road geometry does not allow for a full 6" height crosswalk at a T-intersection and low traffic volumes exist, a combination driveway apron raised crosswalk may be used. Refer to detail VSC_7.0

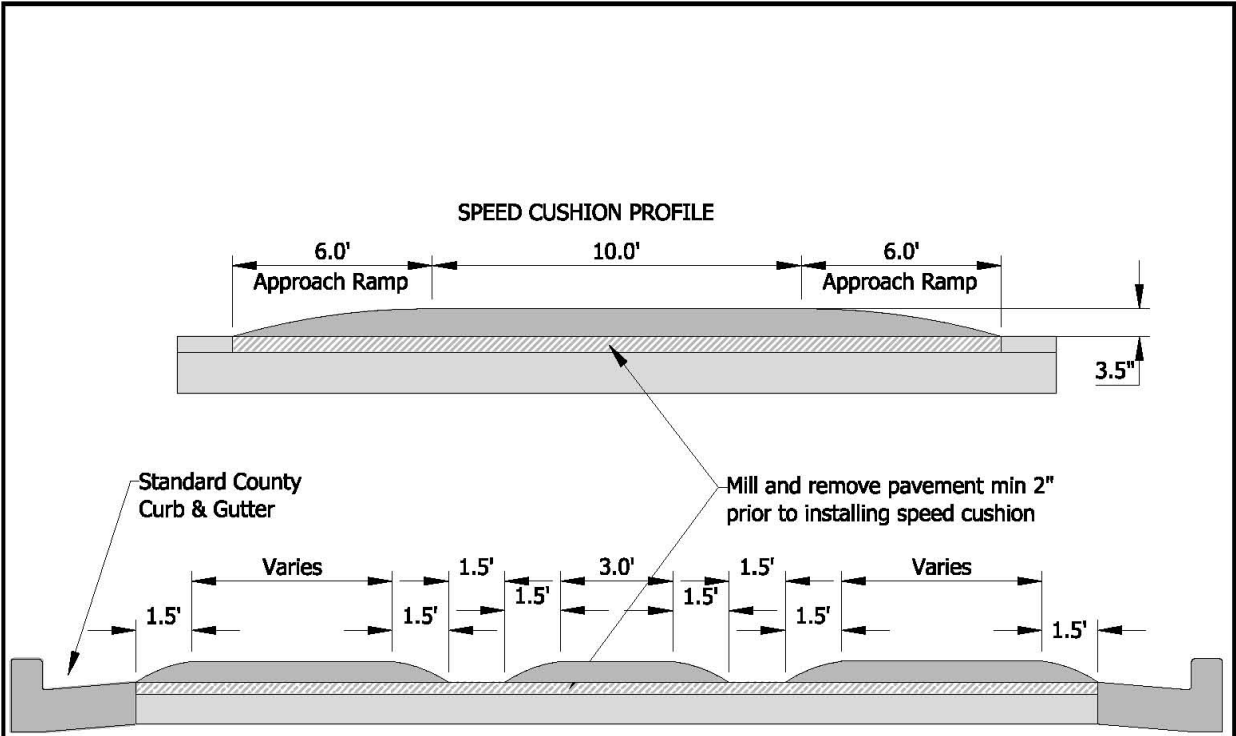
3) The marked crosswalk shall comply with the Arlington County Horizontal Standards H-3.7 Crosswalks standard. The full width of the crosswalk shall be included within the flat portion of the speed table.

4. Raised Intersections are elevated areas covering the entire intersection. Their preferred height is 6" above street height and flush with the adjacent curbs. Where a height of 6" cannot be achieved a minimum height of 3.5" above street level may be considered. In all cases positive drainage must be maintained across the entire intersection. Pedestrian access routes through the raised intersection shall be ADA compliant.

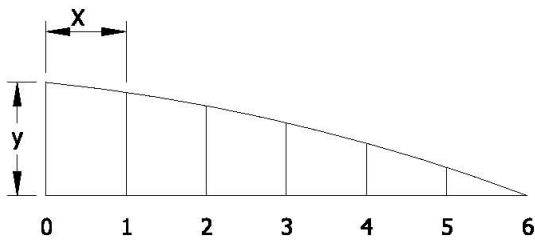
3.2. Materials

3.2.1. Vertical speed control devices shall be constructed of materials that match the street type and shall be designated with County standard markings in a retro reflective material. Asphalt is the preferred material but in some cases concrete on asphalt may be required. Decorative treatment and alternate materials may be approved.





SPEED CUSHION CROSS-SECTION



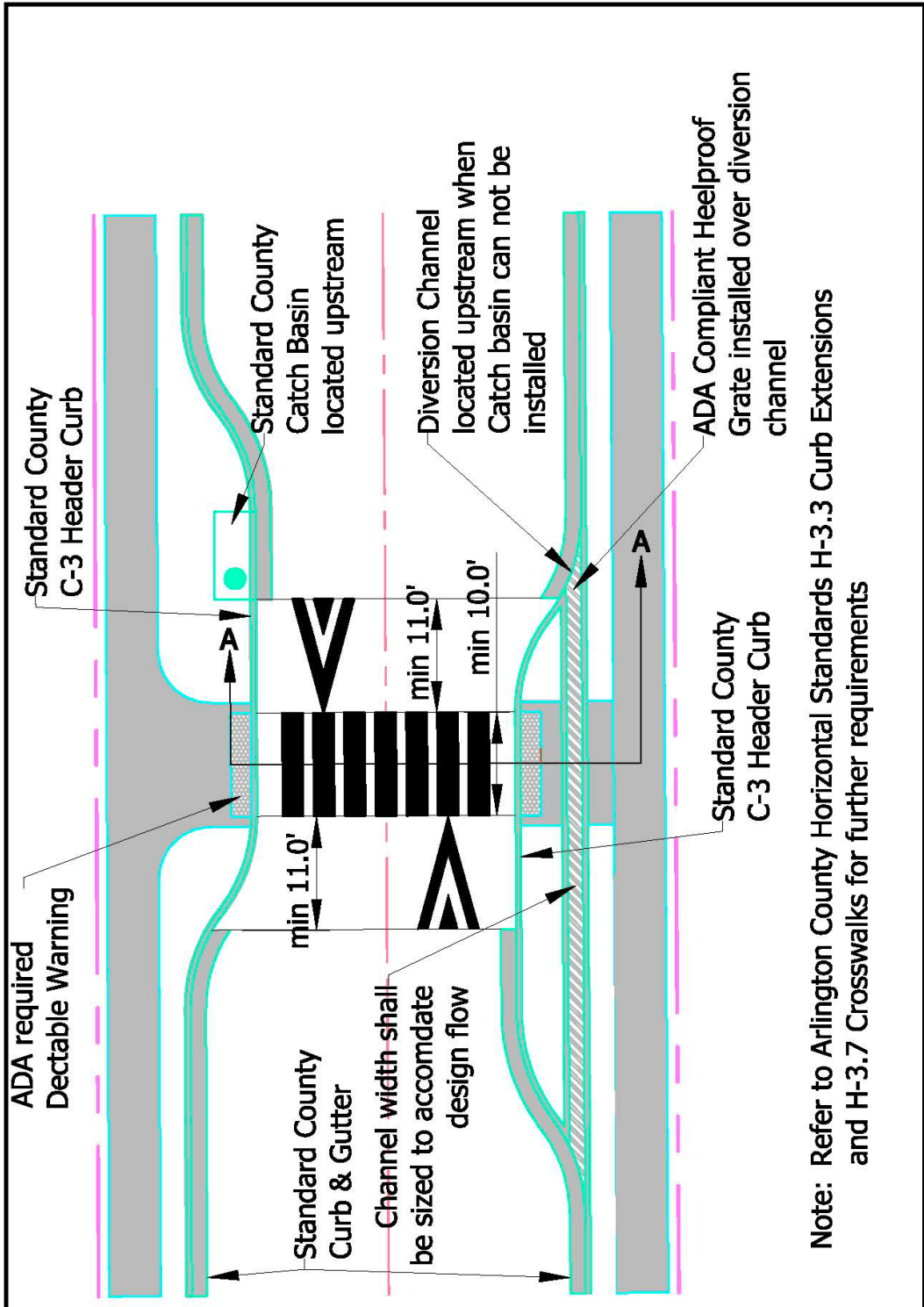
Approach Ramp Dimensions		
x (ft)	y (ft)	y (in)
0	0.293	3.50
1	0.283	3.40
2	0.255	3.06
3	0.225	2.70
4	0.171	2.05
5	0.104	1.25
6	0.000	0.00

APPROACH RAMP PROFILE

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TYPICAL SPEED CUSHION DIMENSIONS		
	REVISION & DATE	

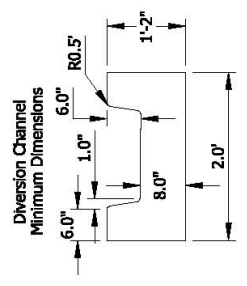
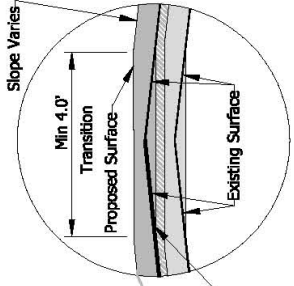
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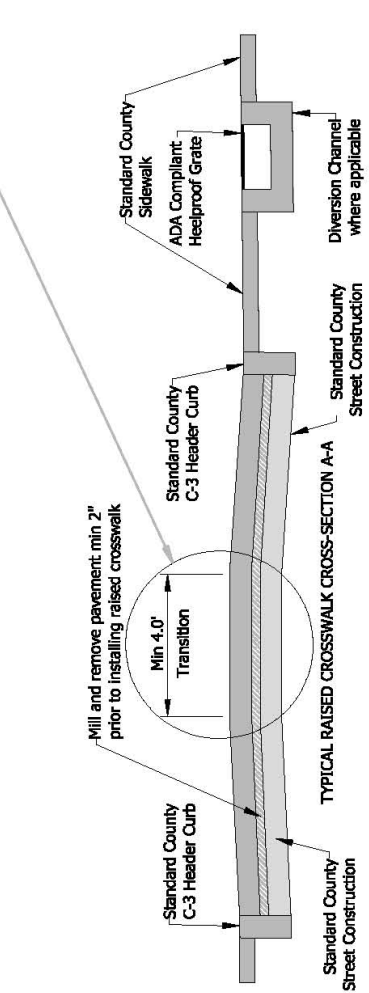
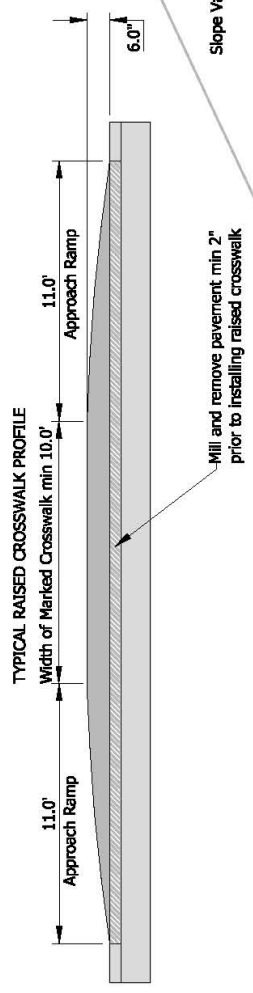
Note: Refer to Arlington County Horizontal Standards H-3.3 Curb Extensions and H-3.7 Crosswalks for further requirements

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TYPICAL 6" RAISED MIDBLOCK CROSSWALK with CURB EXTENSIONS

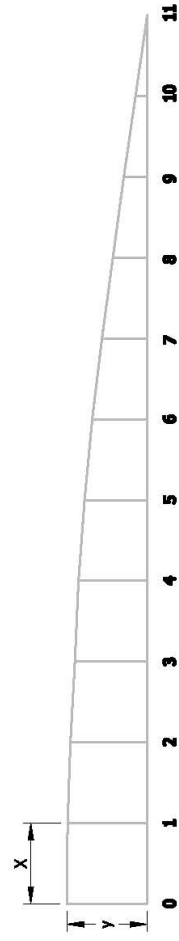


Curb profile may need to be adjusted to meet grate installation requirements



Approach Ramp Dimensions

x (ft)	y (ft)	Y (in)
0	0.500	6.00
1	0.490	5.88
2	0.480	5.76
3	0.450	5.40
4	0.420	5.04
5	0.390	4.68
6	0.340	4.08
7	0.280	3.36
8	0.225	2.70
9	0.171	2.05
10	0.104	1.25
11	0.000	0.00



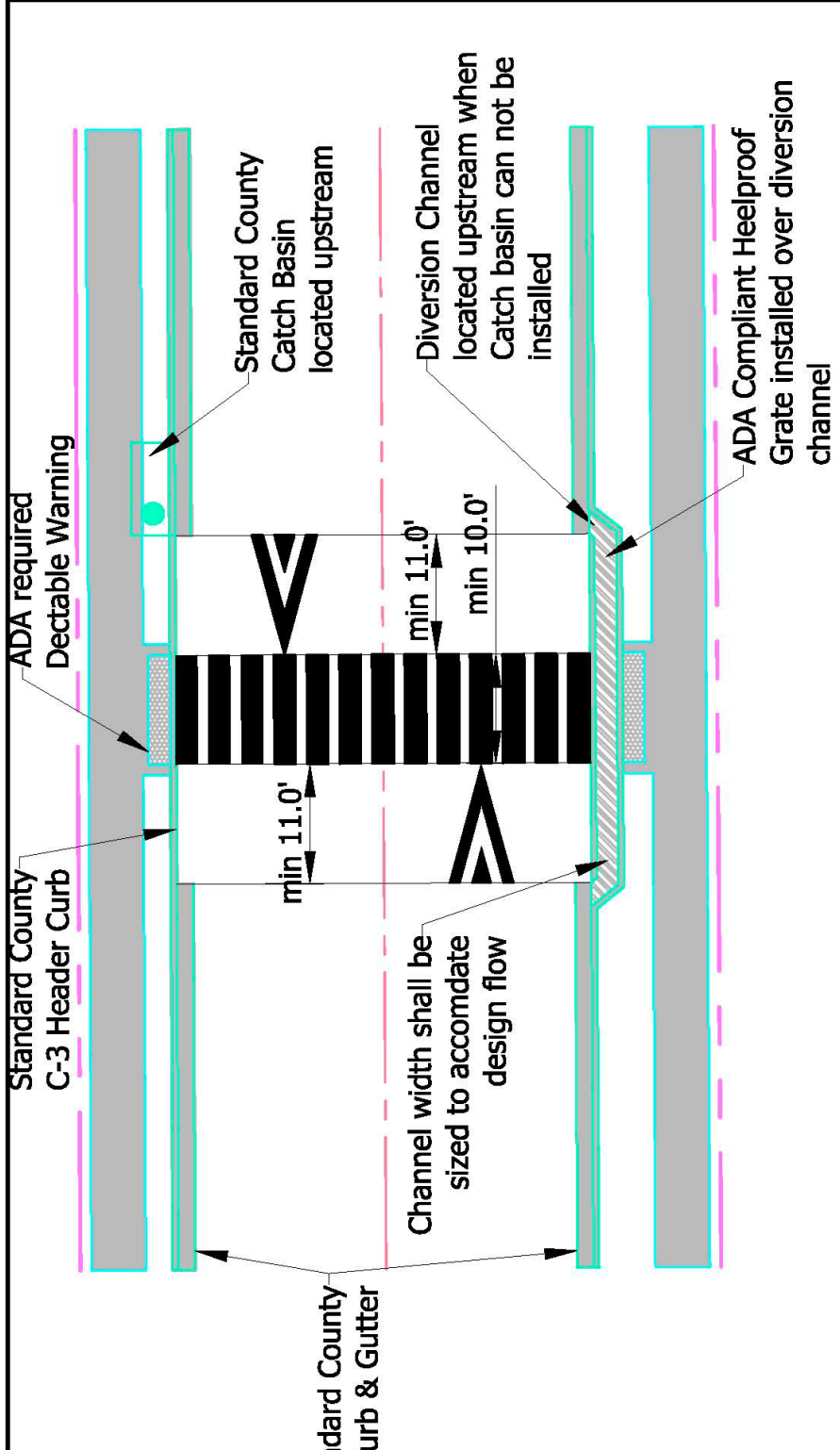
APPROACH RAMP PROFILE

TYPICAL 6" RAISED MIDDLEBLOCK CROSSWALK

ARLINGTON COUNTY, VIRGINIA
DEPARTMENT OF ENVIRONMENTAL SERVICES

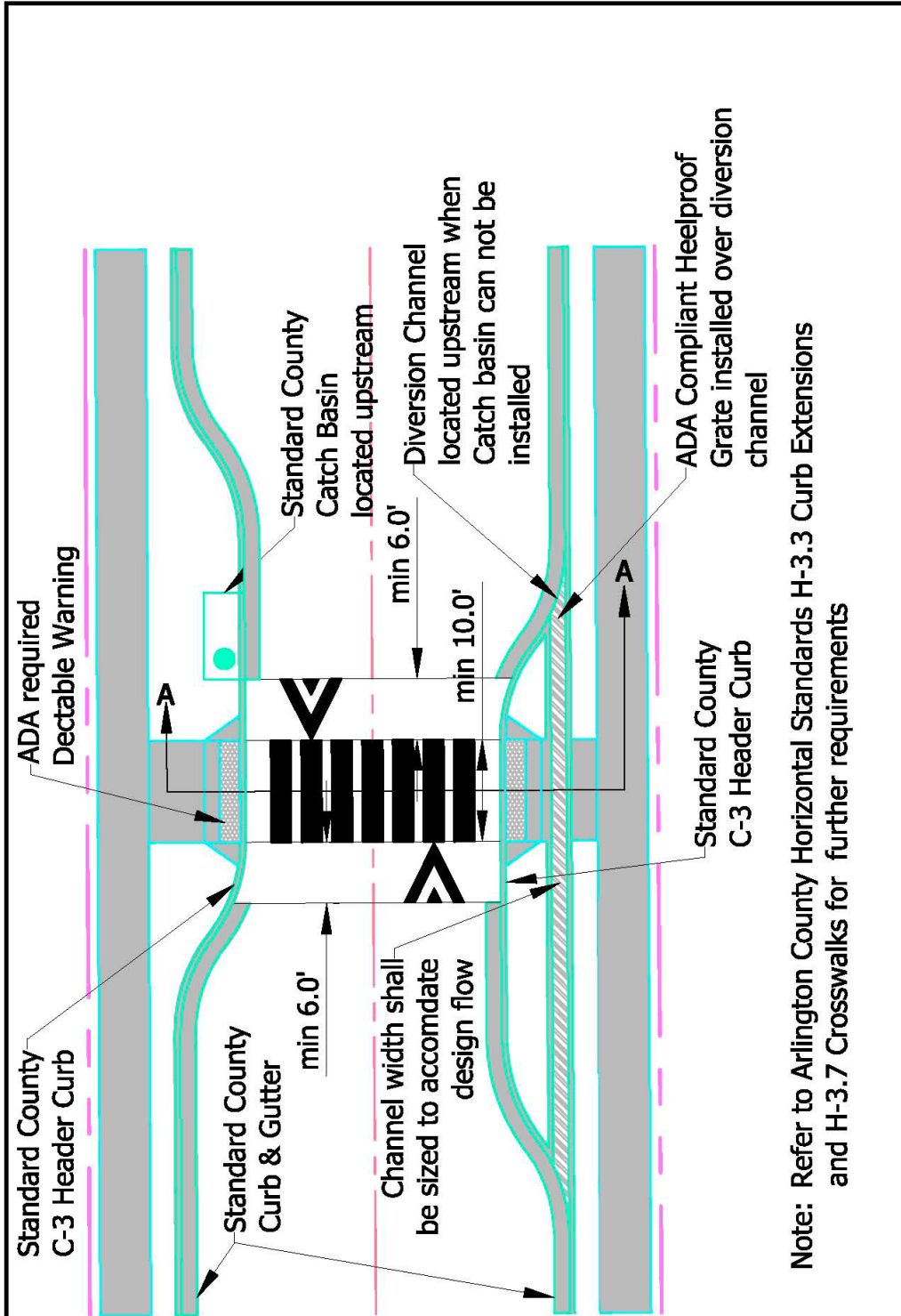
REVISION & DATE

DRAWING NO.
VSC-3.0
Sheet 2 of 3



Note: Refer to Arlington County Horizontal Standards H-3.3 Curb Extensions and H-3.7 Crosswalks for further requirements

TYPICAL 6" RAISED MIDBLOCK CROSSWALK without CURB EXTENSIONS	
ARLINGTON COUNTY, VIRGINIA DEPARTMENT OF ENVIRONMENTAL SERVICES	DRAWING NO. VSC-3.0 Sheet 3 of 3
	REVISION & DATE



Note: Refer to Arlington County Horizontal Standards H-3.3 Curb Extensions and H-3.7 Crosswalks for further requirements

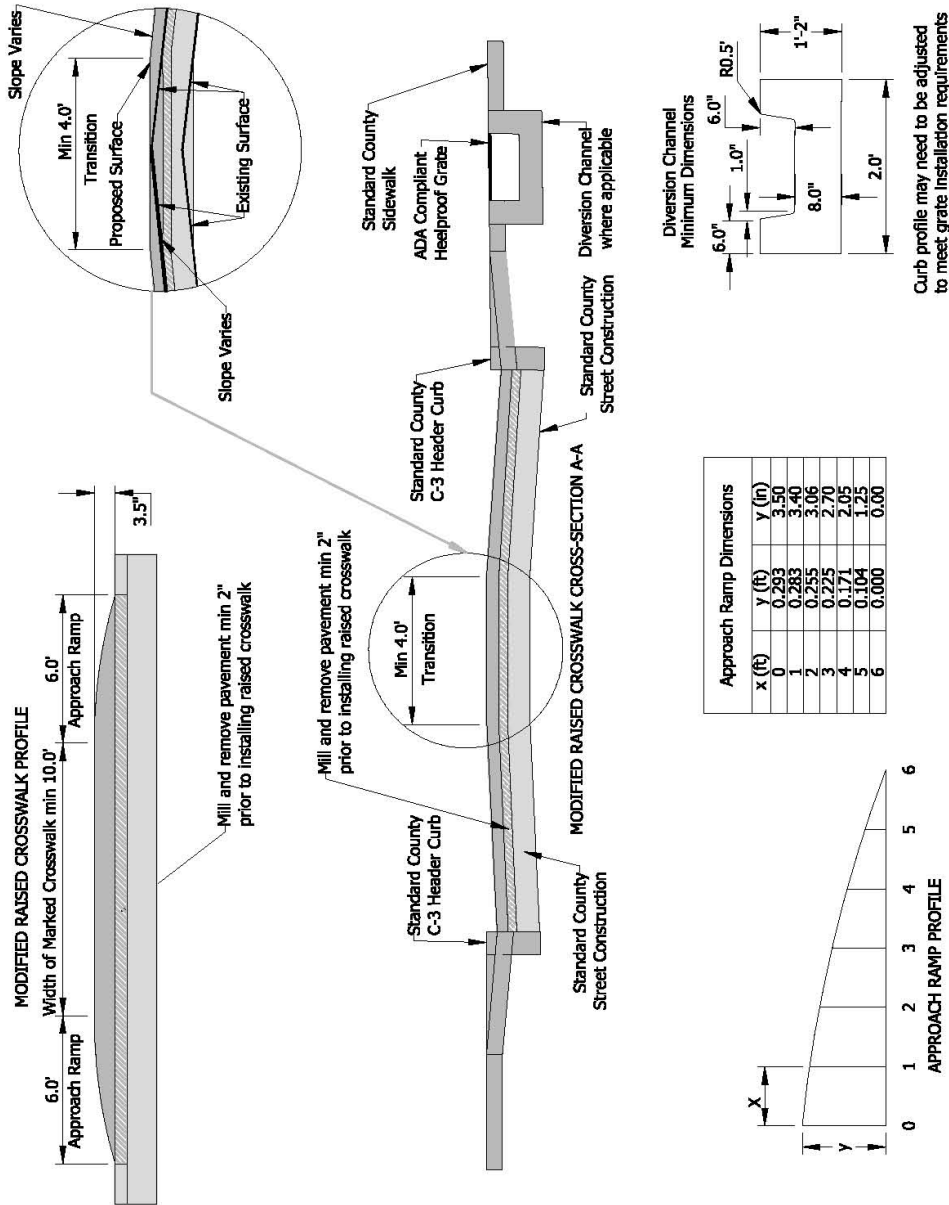
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MODIFIED 3.5' RAISED MIDBLOCK CROSSWALK with CURB EXTENSIONS

DRAWING NO.
VSC-4.0
 Sheet 1 of 3

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MODIFIED 3.5' RAISED MIDBLOCK CROSSWALK

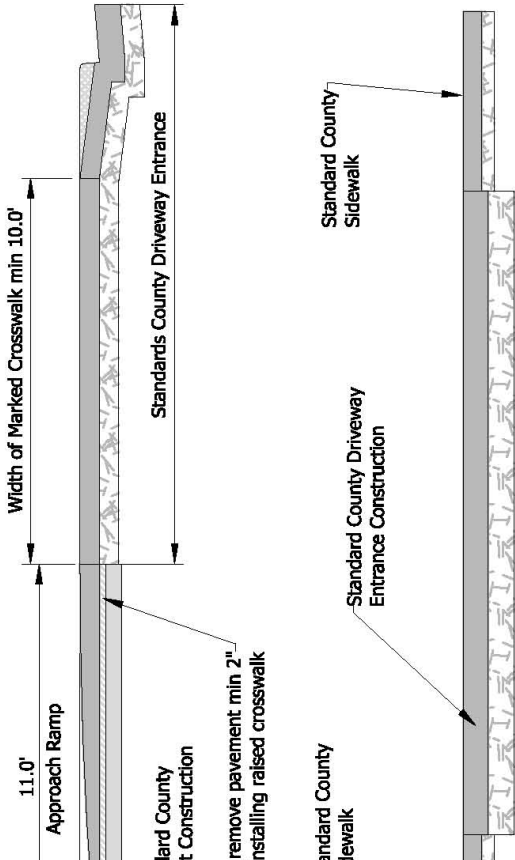
ARLINGTON COUNTY, VIRGINIA
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REVISION & DATE

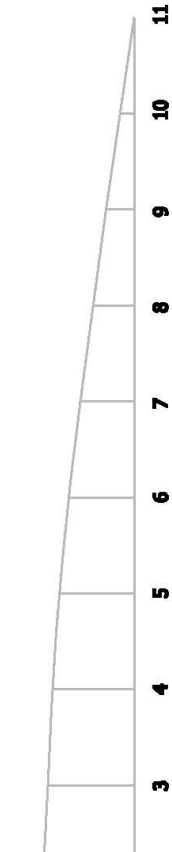
DRAWING NO.
VSC-4.0
 Sheet 2 of 3

T O N

COMBINATION DRIVEWAY RAISED CROSSWALK PROFILE



COMBINATION DRIVEWAY RAISED CROSSWALK CROSS-SECTION A-A



APPROACH RAMP PROFILE

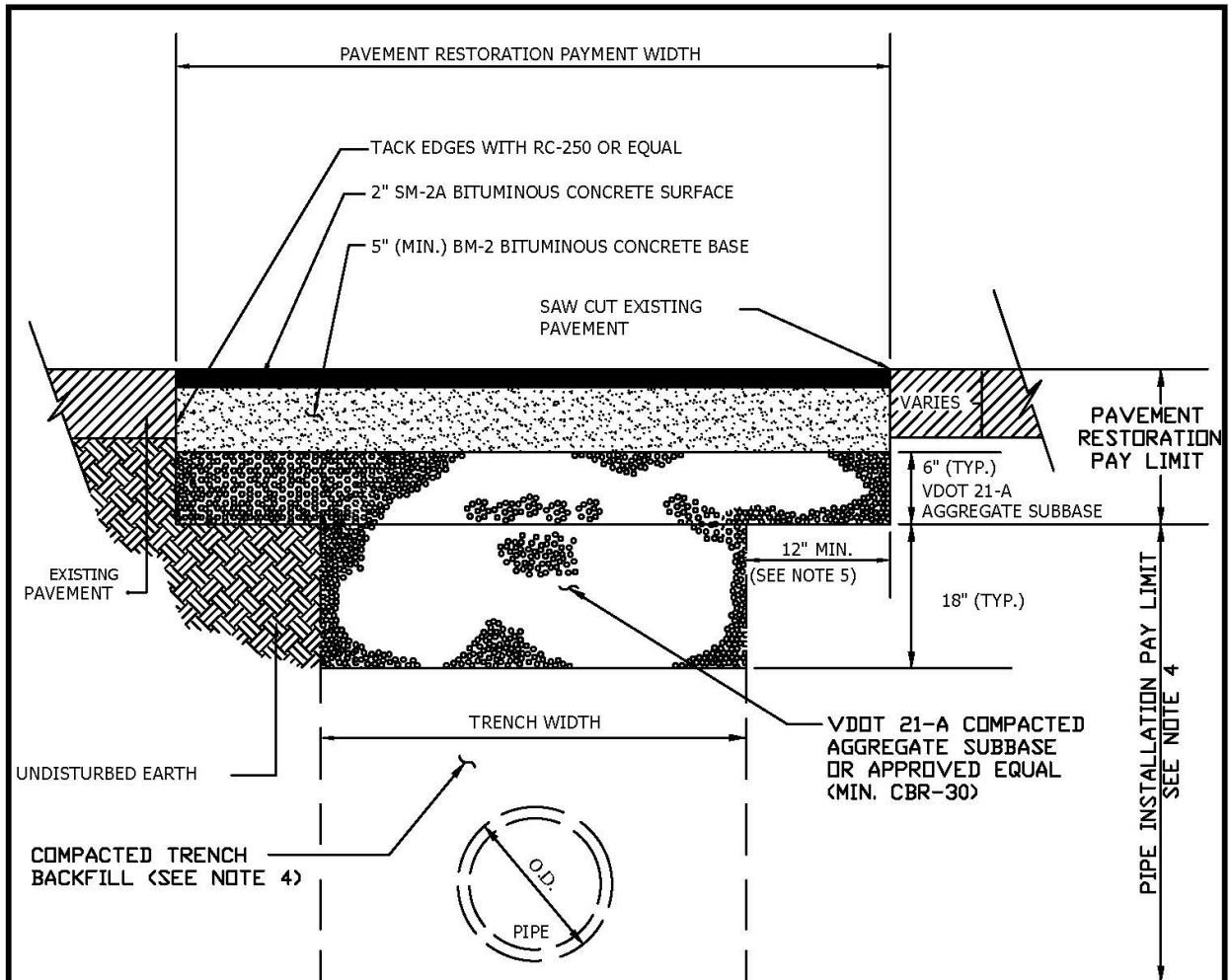
Approach Ramp Dimensions		
x (ft)	Y (ft)	Y (in)
0	0.500	6.00
1	0.490	5.88
2	0.480	5.76
3	0.450	5.40
4	0.420	5.04
5	0.390	4.68
6	0.340	4.08
7	0.280	3.36
8	0.225	2.70
9	0.171	2.05
10	0.104	1.25
11	0.000	0.00

COMBINATION DRIVEWAY/ 6" RAISED CROSSWALK

**ARLINGTON COUNTY, VIRGINIA
DEPARTMENT OF ENVIRONMENTAL SERVICES**

**DRAWING NO.
VSC-7.0
Sheet 2 of 2**

REVISION & DATE



NOTES :

1. WHEN THE DISTANCE FROM THE EDGE OF EXISTING PAVEMENT TO THE EDGE OF THE PAVEMENT RESTORATION PAYMENT WIDTH IS 3' OR LESS THEN THE ADDITIONAL PAVEMENT SHALL BE REMOVED AND REPLACED BACK TO THE EDGE.
2. THICKNESS OF BM-2 BASE MAY BE REDUCED TO 3" WHEN PATCH IS BEING MADE IN PAVEMENTS OF SURFACE TREATED GRAVEL, AND DIRECTED BY THE ENGINEER.
3. WHEN WIDENING OR PATCHING A STREET WITH ASPHALT, A NEAT, CLEAN JOINT OF AT LEAST ONE (1) INCH IN DEPTH BETWEEN OLD AND NEW PAVEMENT SHALL BE PROVIDED FOR TOPPING SO AS TO ELIMINATE THE NEED FOR FEATHERING OF THE OVERLAY.
4. FOR TRENCH AND BEDDING DETAILS, SEE DRAWING No. M-3.0.
5. WHEN THE UTILITY TRENCH REQUIRES SHEETING & SHORING, A WIDER PAYMENT WIDTH SHALL BE APPROVED BY THE ENGINEER TO ACCOMMODATE TRENCH BOX.

III. SUPPLEMENTARY SPECIFICATIONS

A. SCOPE OF WORK

Contractor shall provide and install utility patch repairs and traffic calming devices on County streets on an as-needed basis for a period of up to five years.

Arlington County has approximately two hundred fifty-six (256) traffic calming devices (speed tables – 160; speed cushion – 96) at various locations throughout the County.

The Contractor is responsible for providing all labor, supervision, materials, equipment, tools, transportation, maintenance of traffic and supplies required to complete the work in accordance with contract terms and conditions.

B. WORK HOURS

The Contractor may start setting up at 7:00 am daily. The Contractor shall complete all work by 5:30 pm daily. No work will be allowed on weekends and County holidays. In the particular case that work is needed to be completed on a weekend, Contractor shall submit a request and will need to be approved by the County Project Officer.

C. TYPES OF INSTALLATION WORK

- Utility Patch Repair (Asphalt):** The County Project Officer shall direct the Contractor to rebuild areas of the County sub-base. The rebuild sub-base shall consist of six inches (6") compacted VDOT 21-A, five inches (5") of compacted bituminous concrete VDOT BM-25, and two inches (2") of VDOT SM-9.5A asphalt topping. Edge milling at two inches (2") is required at each patching area. Unit price shall cover provision and installation of rebuilt sub-base measured in linear foot of edge milling, and in ton for each of the type of material used, including any excavation necessary for completion of the Work. The Contractor shall notify the County Project Officer of any inadequate sub-base discovered during the milling process. Payment will be made according to the line items listed in Section I of the Bid Form titled "Utility Patch Repair".
- Milling (Edge/Full Milling):** The Contractor shall use a milling machine designed to mill the surface specified by the County. The Contractor shall, as directed by the County Project Officer, mill the full width of the street to the depth according to Arlington County DES Construction Standards and Specifications, most current edition. The County may specify a mill depth of more than two inches (2"). A saw cut shall be made to ensure a clean joint between the new asphalt and the undisturbed pavement. The milled surface shall be fully cleaned of all debris and dust. Asphalt that has been milled by the Contractor shall be removed off County street in a timely manner and disposed properly. Payment will be made on the total square feet of surface milled, according to the line items listed in Sections I/II.
- Provide and Install Raised Asphalt:** The Contractor shall install speed tables, raised intersections, and other raised asphalt features. The bid price of this item shall include

providing, installing, forming, and compacting approximately six inches (6") of new asphalt over a milled base. The Contractor shall apply a CRS1 hot tack coat between the milled base and the new asphalt. The new asphalt shall be two hundred forty degrees Fahrenheit (240°F) or hotter when applied to the milled road surface. The new asphalt shall be compacted to final density using a steel roller so that the surface is smooth. Payment will be made on the total tonnage of asphalt installed, according to the line items listed in Section II of the Bid Form titled "Traffic Calming Devices".

4. **Provide and Install at Grade Asphalt:** At grade asphalt is usually installed for the purposes of imprinting a texture pattern for at grade crosswalks. The bid price of this item shall include providing, installing, forming and compacting approximately three to six inches (3"-6") of new asphalt over a milled base. The Contractor shall apply a CRS1 hot tack coat between the milled base and the new asphalt. The new asphalt shall be compacted to full density using a steel roller until the surface is smooth. Payment will be made on the total tonnage of asphalt installed, according to the line items listed in Section II of the Bid Form titled "Traffic Calming Devices".
5. **Provide and Install Preformed Thermoplastic Paver Crosswalk:** Installing preformed thermoplastic paver crosswalk shall include supplying, heating, and installing the crosswalk. The preformed thermoplastic material shall be equivalent or equal to Flint Trading's Traffic Patterns, one hundred twenty-five millimeter (125mm) thick material. The Contractor shall follow the latest application procedures as issued by the material manufacturer. The pattern shall be running bond or herringbone, which shall be specified at the time of the project. Any milling required shall be covered as a separate pay item. Payment will be made on the total square feet of material installed, according to the line items listed in Section II – Traffic Calming Devices.
6. **Provide and Install Centerline and Thermoplastic Markings:** Installing Thermoplastic yellow centerline and markings in the device as directed by the Project Officer. If speed hump markings are used, they shall be a series of white markings placed on a speed hump to identify its location. If markings are used for a speed hump that does not also function as a crosswalk or speed table, the markings shall comply with Option A, B, or C shown in [Figure 3B-29](#). If markings are used for a speed hump that also functions as a crosswalk or speed table, the markings shall comply with Option A or B shown in [Figure 3B-30](#).

Figure 3B-29 Pavement Markings for Speed Humps Without Crosswalks

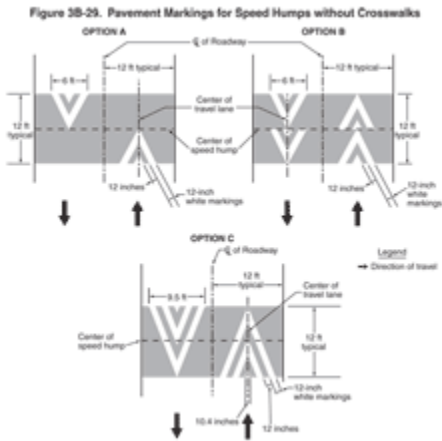
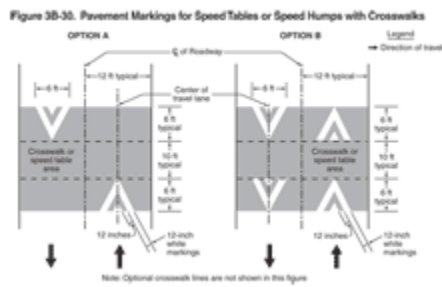


Figure 3B-30 Pavement Markings for Speed Tables or Speed Humps with Crosswalks



D. WORK PERFORMANCE AND APPLICABLE STANDARDS AND SPECIFICATIONS:

1. All Work described in this Invitation-To-Bid (ITB) shall conform to the requirements of the Arlington County DES Standards and Specifications, most current edition and most current edition of the Virginia Department of Transportation Road and Bridge Specifications.
2. For traffic calming device installation work, conformance with Special Provision H-3.8 – Vertical Speed Control Devices shall apply.
3. The Contractor shall furnish, through its workforce or sub-workforce, all necessary and appropriate insurance, supervision, coordination, labor, tools, equipment, machinery, materials, supplies, transportation, maintenance of traffic and any relevant license or patent rights, and other goods and/or services necessary to fulfill the requirements of the Contract.

F. CLEANUP:

1. The Contractor shall ensure all trash (including the “no parking” signs) will be picked up and properly discarded at the end of each workday. Failure in this task will result in the Contractor not working in the County the following workday. The second offense will result in the Contractor not working in the County for one (1) week, the third and final time the County will cancel the contract with the Contractor, going to the next lowest bid Contractor to complete the work intended. Any difference in cost will be taken out of the last invoice from the original Contractor.
2. The Contractor shall not store equipment and materials in the public right-of-way unless approved by the County Project Officer.
3. Unit costs for the bid items also shall include the disposal of all excess and waste materials as well as the clean-up of the project site once the work is complete.

G. CONTRACT PERFORMANCE:

1. The County reserves the right to inspect all operations under this contract and to withhold payment for any work performed which is considered not in accordance with specifications. Payments withheld for this reason will be released upon receipt of satisfactory evidence (site inspection by County inspector) that the work has been corrected to the County's satisfaction. Inspections shall occur within 48 hours of completion and correction shall be done within 24 hours of notice to Contractor at no additional cost to the County.
2. The Contractor will include a sketch of the completed device as part of the supporting documentation. The sketch will include as-built elevations along the device, as per the approach ramp dimensions in the specifications. Any deviation outside of the tolerances limits will be considered not in accordance with the specifications and will need to be corrected at no additional cost to the County.
3. Failure to correct any deficiency in the 24-hour period shall result in cancellation of the Contractor's charge for that portion of the work found deficient. Repeated violations of this provision (more than four call-backs within any calendar month) may result in cancellation of the contract for non-performance. Telephonic notice to the Contractor shall be considered adequate and acceptable notice to enforce this provision.
4. Deliverables (invoice, supporting documents) are due at the end of each month.

H. WORK SITE DAMAGE:

Contractor shall repair or replace, to County's satisfaction at the Contractor's expense, any damage to property (whether owned by the County or others) resulting from work performed under this Contract by the Contractor or its subcontractors.

I. WARRANTY:

All utility patch repairs and traffic calming devices shall be guaranteed by the Contractor, except materials with a manufacturer warranty for **a period of one (1) year** from the date of acceptance (defined as final payment). During this period, all serious defects discovered in utility patch repair and traffic calming devices or workmanship, as determined by Arlington County, shall be repaired or removed and replaced in a satisfactory manner at no cost to Arlington County.

J. MAINTENANCE OF TRAFFIC:

1. The Contractor shall conduct its operation in a manner that will ensure that traffic will be uninterrupted except as approved by the County. At the close of each workday, the area of work shall be confined to the smallest area possible so that the maximum use of the street will be restored and the hazard to traffic reduced to the minimum. No excavation shall remain open within the roadway without the approval of the County except when the excavation can be safely bridged with the use of steel plates or other materials acceptable to the County.
2. When areas of excavation outside of the roadway do remain open, the area shall be barricaded and warning signs shall be posted.
3. At all times the Contractor shall use sufficient workers and traffic control signs and devices necessary to comply with VDOT- Virginia Work Area Protection Manual- Standards and Guidelines for Temporary Traffic Control.
4. During the progress of the work when the street may be obstructed to any extent by construction equipment or construction operations, in addition to the signs and barricades, special workers (flaggers) shall be designated by the Contractor to direct traffic. These workers so designated shall not be assigned to any other duties while engaged in directing traffic.
5. The Contractor has sole responsibility for ensuring that its operations are conducted in a safe manner and not withstanding any other provision to the contrary, shall fully indemnify Arlington County, its officers, agents and employees for any damage or injury related to traffic operations which is caused by negligent or otherwise improper or deficient performance under the contract or nonperformance of the terms of the contract.
6. The Contractor will ensure all crew members (including visitors and supervisors) are wearing the proper Personal Protection Equipment (PPE) (including- hard hat, high visible apparel (i.e. safety vest), steel toe boots, long pants, safety glasses and hearing protection (when needed)).
7. The Contractor is required to comply with the terms and conditions of the current edition of Arlington County DES Construction Standards Specifications and VDOT Virginia Work Area Protection Manual- Standards and Guidelines for Temporary Traffic Control.

8. All personnel, signs, barricades and any other items necessary for the maintenance of traffic and safety shall be provided by the Contractor in accordance with VDOT- Virginia Work Area Protection Manual- Standards and Guidelines for Temporary Traffic Control.
9. The County must have a hard copy of the flaggers' VDOT Basic Work Zone Control Training and Flagger certifications before any work can start.
10. Residential streets shall have a minimum of signs and cones and/or drums around the work area.
11. Arterial streets shall have a minimum of signs, traffic arrow board, and cones and/or drums around the work area.
12. For any arterial street projects, the Contractor must submit a traffic control plan via email to the County Project Officer.
13. Unit costs for the bid items shall include maintenance of traffic. No separate payment shall be made by the County for this work.

K. TRAFFIC CONTROL:

1. The County will furnish and post temporary "NO PARKING" signs on all assigned streets. The Contractor shall notify the County Project Officer, forty-eight (48) hours prior to commencing work.
2. The County Project Officer will inspect the work zone every day to ensure it is set up in accordance with VDOT-Virginia Work Area Protection Manual- Standards and Guidelines for Temporary Traffic Control. If they find any issues that cannot be corrected quickly, they will either stop the work until the issue is corrected or shut down for the remainder of the shift.
3. All traffic control devices and signs will be in accordance with VDOT- Virginia Work Area Protection Manual- Standards and Guidelines for Temporary Traffic Control.

L. PROGRESS OF WORK:

1. The County will schedule a pre-construction conference with the Contractor. Two weeks prior to this conference the County will provide to the Contractor an initial list of work assignments.
2. The County Project Officer shall, prior to the start of any work for a given week, submit to the Contractor a proposed weekly schedule of streets in the order that it anticipates working on them.
3. The weekly schedule may be used by the County to notify businesses and residents who may be affected by the work schedule. The County will, whenever possible, in updating the planned work assignments, attempt to make any new assignments in the same geographic area as the original assignments, except for priority work.

4. The County reserves the right to assign the Contractor additional work (non-planned) as needed. The Contractor shall start the work on these additional assignments within 30 days of the notification.
5. The Contractor shall not stop the progress of work on an assignment, unless a written request stating the reasons for such interruption is approved by the County Project Officer.
6. The County Project Officer may verbally request the Contractor to stop work on an assignment temporarily (for a period of up to five days) at any stage. In such case, the Contractor shall stop work immediately and resume operations within two calendar days of notification from the County to resume work.
7. Scheduling of traffic calming devices installations is a shared responsibility of the County Project Officer and Contractor.
8. During the performance of the work, the Contractor shall identify the causes for any delays attributable to conditions deemed to be beyond the Contractor's control. The Contractor should have all proper and working manhole rehabilitation equipment on-site every day.

FOLLOWING THIS PAGE IS THE AGREEMENT THAT WILL BE ENTERED INTO BETWEEN THE COUNTY AND THE CONTRACTOR. THE AGREEMENT IS PART OF THIS SOLICITATION. THIS AGREEMENT IS SUBJECT TO REVIEW BY THE COUNTY ATTORNEY PRIOR TO BEING SUBMITTED FOR CONTRACTOR'S SIGNATURE.